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# Analysis of Dye Mixtures

## By the Use of Immiscible Solvents

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OF the various methods that may be employed for the analysis of dye mixtures, those involving the use of immiscible solvents are often found to furnish the most reliable and complete information. They are fairly general in scope, and by the application of well understood principles may be adapted to either qualitative or quantitative separation.

In earlier publications[1] the writer has summarized solubility data useful for the analysis by fractionation of mixtures of certain dyes, these being for the most part coloring matters that have been employed in food products but including many of the more widely used acid and basic dyes. Further data are given here that have been found of aid in the systematic analysis of mixtures containing any of the commoner water soluble dyes.

The great number of commercial coloring matters contain individuals showing every gradation of solubility behavior, and no general scheme can be drawn up allocating them in a set of groups separated by sharp border lines; however, the flexible fractionation procedure provides for meeting this condition much better than do precipitation or other common analytical methods. The application of wet extraction and fractionation methods to include all commercial colors is not possible, at present at least, because of the insolubility of the vat, sulfur and similar dyes in most of the available solvents; a feature, however, that facilitates the separation and differentiation of the dyes of these classes from the others.

The U. S. Tariff Commission report[2] for 1930 names some 70 coloring matters exclusive of vat and sulfur dyes that were made and sold in the United States during that year in amounts exceeding 40,000 lbs. These more important dyes, with a few omissions and additions, have been classified into a set of analytical groups based on their relative solubilities in available laboratory solvents. The colors mentioned made up somewhat more than one-half of the total quantity of water soluble dyes sold so it may be said that there is about an even chance that any unknown soluble dye encountered by the analyst will be found to be one on this list. Although dyes arranged according to solubilities may be divided into groups only in an arbitrary way, such an arrangement is convenient and does not interfere with the application of the solubility data to the separation of colors of every gradation of solubility.

### General Statements Relative to the Use of Immiscible Solvents

In methods employing immiscible solvents the solution containing the coloring matter is shaken with a selected solvent which extracts one component dye or dye group in larger proportion than another from the mixture. While dyes differing widely in solubility may be separated from each other quantitatively by a single shaking out operation, more often it is not possible to choose solvents for which the relative solubilities are greatly dissimilar, and some sort of fractionation becomes necessary. This may be illustrated by considering the separation of a mixture of two dyes for which a pair of solvents have been selected, of such characteristics that when 40 cc. of the lighter solvent, and 60 cc. of the heavier containing the dye mixture, are shaken together, 20% of one coloring matter and 80% of the other pass into or remain in the lower layer. This is the most effective separation possible under the conditions chosen, by a single shaking out operation. If the lower layer be drawn into a second funnel and extracted with an additional 40 cc. of the lighter solvent, and another 60 cc. portion of the heavier liquid then shaken successively in the first and second funnels, the combined portions of the heavier liquid will now contain 89.6% of one dye, 10.4% of the other assuming that the partition coefficients of the coloring matters remain unchanged.

A three step fractionation requires three funnels, each charged with a portion of the lighter solvent. The dyes to be separated may be dissolved in a portion of the

heavier solvent and this solution shaken out in succession in each of the funnels. Two (or more) portions of the heavier liquid are then passed through the series of funnels in the same order as was the original solution, each portion being shaken out successively in the first, second and third funnel. With the dyes and solvents just described, a fractionation using three funnels containing the lighter liquid, and three portions of the heavier (i.e., the dye solution and two wash portions), the total heavier liquid will contian 94.2% of the one dye, 5.8% of the other. The calculation of these percentages may be outlined as follows::

When the solution of the dyes in the heavier solvent is shaken in the first funnel, 20% of one of the coloring matters which will be called dye "A" passes into the upper layer, 80% remaining in the lower liquid. This lower layer when drawn into the second funnel and shaken, gives up 20% of its 80%, or 16% of A to the upper layer, and then contains 64% of A. When shaken in the third funnel it loses 20% of 64%, or 12.8% more of A, retaining 80% of 64%, or 51.2% of this dye when drawn off after the shaking.

The first portion of the heavier washing liquid is now added to the lighter liquid in the first funnel containing as has been shown, 20% of the total amount of A. After shaking, the upper layer contains but 20% of 20% of A. The lower layer containing 80% of 20%, or 16% of A is drawn into the second funnel containing its portion of lighter liquid charged with 16% of A derived from the shaking with the original solution. The total amount of A in the two layers is 16% + 16%, or 32%, and on shaking, this is distributed so that 80% of 32%, or 25.6% is in the lower layer, 20% of 32%, or 6.4% in the upper layer. The lower layer is then drawn into the third funnel which contains its portion of lighter solvent with 12.8% A as has been stated. The total amount of A in the third funnel is 25.6% + 12.8%, or 38.4%. After the shaking, the upper layer contains 20% of 38.4%, or 7.68%, the lower layer 80% of 38.4%, or 30.72%, and is drawn off and combined with the extracted original solution, the combined solution containing 51.2% + 30.72% of dye A.

The second washing portion of heavier liquid, when shaken in the first funnel removes 80% of the 4% of A which the upper layer contained. When drawn into the second funnel it therefore contains 3.2%, which with the 6.4% in the lighter solvent portion in this funnel makes 9.6%. After shaking, the lower layer contains 80% of 9.6%, or 7.68%, and is drawn into funnel No. 3 containing its light solvent portion with 7.68% dye A, the total amount of A in the funnel being 15.36%. After the shaking, the lower layer contains 80% of 15.36%, or 12.288%. It is drawn off and combined with the extracted original solution and the first washing portion, the total dye A in the combined heavier liquids being 51.2% + 30.7% + 12.3%, or 94.2%.

It is apparent that the conditions postulated for this fractionation are such that all statements of the amounts of dye A in the various portions of the heavier liquid will hold exactly for the amounts of the other dye, which may be called B, in the corresponding portions of the lighter liquid. At the end of the operation therefore, the total lighter liquid in the funnels will contain 94.2% of dye B, leaving 5.8% as the amount of this coloring matter in the combined heavier liquids.

The usefulness of the fractionation procedure in dye analysis is due in large measure to the fact that the course of the separation may always be judged by the appearance of the various portions of the solvents. Even with two dyes not differing widely in hue, the relative depth of color of the first and last fractions will show whether or not a good separation has been effected. In such a case both the last washing portion and the liquid in the last funnel will be but slightly colored.

No doubt with all dyes the partition coefficients or distribution ratios change somewhat with changes in concentration, but experience has shown that such variations in the distribution are seldom great enough to interfere with the use of the method. Since the course of the separation may be followed more or less by the eye, any considerable deviation from the expected behavior will be apparent and the proper modification of procedure indicated.

It is important that solvents be selected that give the minimum of difficulty from emulsification. Troublesome emulsions are not often obtained with acid, and especially with strongly acid mixtures. Normal solutions of the fixed alkalies give less difficulty than pure water or dilute solutions of ammonia or sodium carbonate. Some organic liquids, benzene for example, seem to emulsify with water rather more readily than their viscosity, gravity and surface tension characteristics might lead one to expect and are unsatisfactory for this reason.

The solutions under examination usually contain less than 0.05% coloring matter so that even very small amounts of reactive substances present as impurities in the organic solvents may bring about chemical change in an appreciable portion of the color. Irregularities from this cause have been observed hitherto only with amino-azo dyes but probably too little attention is ordinarily given to the matter. Although perhaps less satisfactory from the standpoint of pure science it is believed to be more practical to use mixtures of a few carefully tested organic solvents than a correspondingly greater number of "straight" or unmixed substances. Mixed solvents also are more economical and convenient since the composition of the solvent may be changed without transfer of dissolved coloring matters.

Reactions between the solvents themselves and the dissolved dyes are possible sources of error. One might expect that mixtures of 4-normal hydrochloric acid and amyl alcohol would partially esterify some of the carboxy and hydroxy dyes, but such reactions have not been observed to take place to an appreciable extent in the ordinary steps of analysis.

Aniline though a very useful solvent has the disadvantage that it must be removed with the greatest care (with ether or otherwise) from aqueous dye solutions contaminated with it before making diazotization or coupling tests. Experiments made with a considerable number of dyes have indicated that n-butyl alcohol may be substituted for amyl alcohol (isoamyl alcohol) in all tests described in this paper, giving practically the same results.

### Classification

*Group* 1—Basic dyes, not extracted by ether from acid solutions but extracted from solutions made alkaline with potassium hydroxide, as dye bases. The ether solutions of the dye bases may be colorless, but become colored on shaking with acetic acid.

The dyes are extracted in large proportion by amyl alcohol from normal (6%) sodium chloride solutions. For behavior with amyl alcohol and dilute hydrochloric acid see further below.

20 Chrysoidine
331 Bismarck brown
332 Bismarck brown 2B
655 Auramine
657 Magenta
680 Methyl violet
729 Victoria blue B
749 Rhodamine B
793 Phosphine
841 Safranine
(909 Cotton blue)
(922 Methylene blue)

*Group* 2—Dyes extracted in large proportion by ether from 1/64-normal hydrochloric acid solutions, but not from dilute alkaline solutions. They are extracted almost completely from 1/64-normal hydrochloric acid by a mixture of equal volumes of amyl alcohol and petroleum ether, and by amyl alcohol.

36 Chrome yellow 2G
204 Chrome blue black A
299 Chrome black F
768 Eosine

*Group* 3—Dyes extracted in relatively small proportion by ether from 1/64-normal hydrochloric acid solutions: extracted in large proportion by 1:1 amyl alcohol-petroleum ether mixture from hydrochloric acid solutions of acid strength 1/64- to 4-normal: Extracted almost completely by amyl alcohol from hydrochloric acid solutions 1/64-normal and stronger: Extracted almost completely by amyl alcohol from normal sodium chloride solutions or from similar or stronger potassium chloride solutions.

26 Croceine orange
138 Metanil yellow
146 Azo yellow
(150 Orange 1)
151 Orange 11
176 Fast red A
202 Chrome Blue Black U
234 Resorcin brown B
289 Fast cyanine 5R
307 Fast cyanine black B
326 Direct fast scarlet
365 Chrysophenine G
382 Direct scarlet B
626 Fast light yellow 2G

*Group* 4—Dyes precipitated almost completely from aqueous solutions by hydrochloric acid. When solutions are acidified either slightly, (1/64-normal), or strongly (4-normal) with hydrochloric acid and shaken with 1:1 amyl alcohol-petroleum ether mixture most of the dye collects at the interface between the liquids as a colored precipitate. Acidified solutions shaken with amyl alcohol behave similarly, except that much dye may be held in solution in the organic solvent.

The dyes are precipitated from aqueous solutions by addition of 6% or more sodium chloride. On shaking such salt mixtures with amyl alcohol the dye passes mainly into the organic solvent, either in solution or suspension.

The dyes are extracted almost completely from slightly acidified solutions (1/64-normal to 1/8-normal with hydrochloric acid) by a mixture of equal volumes of aniline and amyl alcohol. When the solutions or suspensions in 1:1 aniline-amyl alcohol mixture so obtained are shaken with normal potassium hydroxide solution very little dye is removed by the alkaline aqueous solution.

370 Congo red
419 Direct fast red F
488 Benzopurpurine 4B
539 Direct fast black FF
581 Direct deep black EW
582 Direct deep black RW
596 Direct brown 3GO
812 Primuline
814 Direct fast yellow
1078 Alizarine cyanine green E
1085 Anthraquinone blue black B

*Group* 5—Dyes similar to those of group 4 excepting that when their solutions (or colloid suspensions) in 1:1 aniline-amyl alcohol are shaken with normal potassium hydroxide solution, most of the dye passes into the aqueous layer.

401 Developed black BHN
420 Direct brown M
502 Direct azurine G
512 Direct blue RW
593 Direct green B
598 Direct brown

*Group* 6—Dyes not extracted in large proportion from 4-normal hydrochloric acid solutions by 1:1 amyl alcohol-petroleum ether mixture: Partially extracted from 4-normal hydrochloric acid, and almost completely extracted from 1/64-normal hydrochloric acid solutions by amyl alcohol: Extracted almost completely from normal sodium

chloride solutions by amyl alcohol: Extracted in large proportion from slightly acid solutions by a mixture of one volume alpha-dichlorohydrine with three volumes carbon tetrachloride.

666 Acid green B
698 Acid violet
704 Alkali blue
714 Patent blue A
909 Cotton blue
922 Methylene blue

*Group* 7—Dyes extracted in large proportion from 4-normal but not from 1/64-normal hydrochloric acid solutions by 1:1 amyl alcohol-petroleum ether mixture: Extracted in large proportion by amyl alcohol from hydrochloric acid solutions normal or stronger. The dyes are not extracted in large proportion by amyl alcohol from normal sodium chloride solutions, nor from 1/64-normal hydrochloric acid by dichlorohydrine.

27 Orange G
31 Amidonaphthol red G
56 Fast fuchsine 6B
79 Ponceau 2R
88 Bordeaux B
150 Orange 1
179 Azorubine
180 Fast red VR
208 Fast acid blue R
216 Chrome red B
246 Acid black 10B
252 Brilliant croceine
282 Ponceau S
364 Paper yellow
518 Direct pure blue 6B
(707 Soluble blue)
(814 Direct fast yellow)
— Sunset yellow

*Group* 8—Dyes extracted in amount less than one-half by 1:1 amyl alcohol-petroleum ether mixture from 4-normal hydrochloric acid: Extracted in but small proportion by same solvent from normal or more dilute hydrochloric acid solutions: Extracted in large proportion by amyl alcohol from 4-normal hydrochloric acid but not from acid 1/4-normal or below: Not extracted by amyl alcohol from normal sodium chloride solutions, nor by dichlorohydrine from slightly acid solutions.

57 Amido naphthol red 6B
184 Amaranth
185 Cochineal red
620 Direct yellow
640 Tartrazine
1180 Indigocarmine

*Group* 9—Dyes not extracted in large proportion from either strong or dilute solutions by amyl alcohol: Extracted in large proportion from slightly acid solutions by dichlorohydrine.

670 Acid light green
671 Erioglaucine A
737 Wool green S
(865 Nigrosine w.s.)

*Group* 10—Dyes not extracted in large proportion from strong or dilute hydrochloric acid solutions by amyl alcohol: Not extracted in large amount by dichlorohydrine from slightly acid solutions.

Like dyes of all preceding groups, extracted in large proportion by 1:1 aniline-amyl alcohol mixture from 1/16-normal (and stronger) hydrochloric acid solutions.

406 Direct blue 2B
477 Direct blue 3B
520 Direct pure blue
865 Nigrosine, water soluble
1054 Acid alizarine blue B

*Group* 11—Dyes not included in preceding groups.

692 Acid magenta

### Comment Regarding the Dye Groups

Group 1. The basic dyes form a natural group and have been listed together on the ground of their behavior with potassium hydroxide and ether. However in many cases the formation of an ether soluble color base does not take place smoothly, the reaction being inapplicable in analysis excepting as a qualitative test.

Solutions of Methylene blue and Cotton blue when treated with alkali and immediately shaken with ether give up very little dye derivative to the ether. These dyes therefore properly belong with Group 6.

The basis dyes are comparatively stable in acid solutions. The table on page 745 shows the behavior of some dyes of Groups 1 and 6 in acid solvent mixtures.

Groups 2, 3, 7 and 8. The dyes of these groups may be arranged in a single series, the adjacent members of which differ but slightly from each other in respect to their solubility relations. Solubility data for a number of these acid dyes are given in U. S. Dept. Agri. Bull. 448. Those not mentioned in this publication have solubilities as shown by reference on page 745.

The phthaleine indicators may be included in Groups 2 and 3. Properties that may be applied for their separation and differentiation are given on page 745.

### Analysis

An unknown dye or dye mixture must of course first be examined qualitatively: components showing sufficient differences in their solubilities may then be separated quantitatively if desired from another portion of the solution by fractionation.

Any set scheme for the qualitative examination must be offered as a general outline or summary of properties, convenient for reference, but seldom to be followed in its entirety. Few color mixtures are encountered containing more than three or four straight dyes, and in any particular case the most rational procedure to follow will depend on the known solubility relations of the dyes considered most likely to be present. Short tests useful for preliminary information include that for basic dyes with alkali, ether and acetic acid, and treatment with hydrochloric acid and amyl alcohol.

The outline given below provides for the separation of the dye groups named, with the exception of the group of basic colors. These are not separated together, but in accordance with the different solubilities of the various dyes as shown on page 745. Of course, a preliminary alkaline extraction of the solution with ether may be made, if desired, at the risk of some chemical alteration of the dyes.

The acid colors classed as Group 6, and discussed on page 745 with the basic dyes resemble these in being more readily extracted by organic solvents from weakly acid than strongly acid solutions. When dyes of Groups 1 or 6 are known to be present it may be advisable to reserve a portion of the solution for their examination, beginning the treatment of this by adding 1/20 its weight of sodium chloride and extracting dyes of Groups 1, 2, 3 and 6 by amyl alcohol.

The separation of the benzidine and similar acid-insoluble colors by precipitation in presence of an organic solvent obviates to a large extent the occlusion of soluble dyes. Coloring matters but partially precipitated must of course be identified in both precipitate and filtrate. The means described for the separation of the two groups of direct dyes from each other are intermediate between precipitation and solvent methods. They have been found adaptable to quantitative processes, but can not be as satisfactory as those in which the coloring matters are fully soluble in both phases.

*Outline of separation.* The dye solution should contain not less than 0.005% and not much above 0.05% coloring matter, 0.03% to 0.05% being in most cases quite suitable. If not practically neutral it may be made so by addition of hydrochloric acid or potassium hydroxide as required.

50 to 100 cc. of the solution (S-1) is shaken in a separatory funnel with half its volume conc. hydrochloric acid and about 40 cc. 1:1 amyl alcohol-petroleum ether mixture. The color acids of the dyes of Groups 4 and 5 are more or less completely precipitated if present, the precipitate tending to collect at the interface between the two liquids. The mixture if not perfectly clear is filtered quickly with suction through an asbestos pad and the pad washed with a few cc. of water, the washings being received with the filtrate. The receiving flask is changed, the precipitate moistened with a few cc. of normal potassium hydroxide solution, then washed with two or three small portions of water which will dissolve the dyes. The alkaline solution so obtained is made slightly acid (from 1/64 to 1/16-normal) with hydrochloric acid and shaken with 30 cc. 1:1 and aniline-amyl alcohol mixture that will take up practically all coloring matter. The lower layer is drawn off and discarded, and the organic solvent then shaken out successively with two portions of normal potassium hydroxide solution. Dyes of Group 4 remain in the aniline-amyl alcohol, while those of Group 5 are in the potassium hydroxide solution.

The filtrate obtained when the insoluble color acids are filtered off from the original mixture, or the latter itself if no precipitate was formed, is poured into a separatory funnel and the lower layer drawn off into a second separator where it is again shaken with 20 to 40 cc. of the amyl alcohol-petroleum ether mixture. The lower aqueous solution is again drawn off and the solvent extract added to that in the first funnel. The aqueous solution (S-2) is treated for dyes of Group 8, etc., as stated further below. The combined amyl alcohol-petroleum ether extracts should contain all dyes of Groups 2 and 3, all except small portions of those of Group 7, and portions of the dyes of Group 8. Small portions of dyes of Groups 4 and 5 which escaped precipitation may be present but usually may be disregarded. A few of the basic dyes of Group 1, and small portions of some of the dyes of Group 6 may also be found in this section. It may be washed successively with normal, 1/4-normal, and 1/64-normal hydrochloric acid, water and 1/64-normal potassium hydroxide which will effect a partial separation of the dissolved dyes according to their solubility differences, and indicate the most suitable of the liquids for their further fractionation.

The solution (S-2) remaining after the extraction with amyl alcohol-petroleum ether mixture, and which is strongly acid, is shaken out with 30 cc. amyl alcohol, and if this removes coloring matter, extracted a second time, the two amyl alcohol portions being then combined. The extracted acid solution (S-3) may contain dyes of Groups 6, 9, 10 and 11, and some of those of Group 1. The amyl alcohol contains the chief part of any dyes of Group 8 present, perhaps also certain basic dyes, and small portions of dyes of Group 6. By washing it with water three or four times or until nearly all of the hydrochloric acid dissolved by the solvent has been removed, any dyes of Group 8 will be taken out by the water.

The acid solution (S-3) is just neutralized by addition of strong potassium hydroxide solution then made faintly acid with acetic acid. Finally, it is shaken out with one or two portions of amyl alcohol that will remove any dyes of Group 6 present, and certain of the basic dyes of Group 1. The extracted solution (S-4) should now contain only dyes of Groups 9, 10 and 11. The amyl alcohol extract, if colored, is diluted with several volumes of petroleum ether, the dissolved dyes washed out with water, and from the aqueous solution so obtained dyes of Groups 1 and 6 separated by the use of ether and alkali, amyl alcohol and dilute hydrochloric acid or other method. The solution (S-4) is shaken out with from one to three small portions alpha-dichlorohydrine, and will then contain only dyes of Groups 10 and 11 (S-5). The dichlorohydrine solution, if colored, may be diluted with several volumes of carbon tetrachloride, and the coloring matters of Group 9 washed out with a little water. The aqueous solution (S-5), if colored, is treated with just sufficient hydrochloric acid so as to show a mineral acid-reaction with congo red paper, then extracted with 1:1 aniline-amyl alcohol mixture removing dyes of Group 10.

The dissolved dyes may be removed by water from this solvent after diluting it with several volumes of ether or petroleum ether.

### Examples of Separations

*No. 252 Brilliant Scarlet, No. 401 Developed Black BHN, No. 448 Benzopurpurine 4B, and Methylene Blue.*

Eighty c.c. of the solution of the mixed dyes was treated with 30 c.c. of 1:1 amyl alcohol-petroleum ether mixture and 40 c.c. conc. hydrochloric acid. After cooling slightly under the tap, to room temperature, the liquids were shaken well together and the mixture filtered through an asbestos pad. The filtrate consisted of a pure red solution of Brilliant scarlet in the organic solvent, and a pure blue solution of Methylene blue in the aqueous acid, the separation of these dyes being nearly quantitative without further treatment. The residue on the filter was washed with a few c.c. water, moistened with normal potassium hydroxide solution, then washed with several 30 c.c. portions of warm water which dissolved the precipitated dyes. The total filtrate after cooling was made very slightly acid with hydrochloric acid and shaken with 30 c.c. of 1:1 aniline-amyl alcohol mixture which extracted practically all coloring matter. The lower layer was drawn off and discarded. The organic solvent was then shaken out with two 40 c.c. portions of normal potassium hydroxide which extracted the Black as a purple solution. The Benzopurpurine remained in the organic solvent, and was removed by adding 60 c.c. petroleum ether and washing with several portions of water.

*No. 419 Direct Fast Red F, No. 593 Direct Green B, No. 640 Tartrazine and No. 698 Acid Violet.*

One hundred c.c. of the solution of the dye mixture was treated with 50 c.c. conc. hydrochloric acid and shaken with 30 c.c. 1:1 amyl alcohol-petroleum ether. The mixture was filtered on asbestos and washed with about 10 c.c. water containing a trace of hydrochloric acid. The filtrate and washings were poured into a separatory funnel, the lower layer drawn off into another funnel and extracted successively with four 20 c.c. portions amyl alcohol, the last portion removing very little coloring matter. The amyl alcohol extracts containing the Tartrazine were combined, then washed with several portions of water, the first portion taking out mainly dissolved hydrochloric acid, the subsequent ones giving a nearly pure yellow solution of the dye. The acid solution from which the Tartrazine had been extracted with amyl alcohol was made slightly alkaline with potassium hydroxide then slightly acid with acetic acid. From the deep violet solution so obtained the Acid Violet was removed nearly free from other dyes by extracting with a few portions of amyl alcohol, and finally obtained in water solution by treating the combined amyl alcohol with several volumes of petroleum ether and washing with a little water.

The precipitated dyes on the filter pad were moistened with a little potassium hydroxide solution, then washed with several portions of water which readily dissolved the dyes. The combined filtrate was made slightly acid with hydrochloric acid and shaken with 30 c.c. of 1:1 aniline-amyl alcohol mixture with extracted all coloring matter. The lower layer was drawn off and discarded and the solvent mixture then shaken out with three 40 c.c. portions of normal potassium hydroxide solution which removed the Direct green nearly free from other dyes. The solvent solution of Fast red remaining in the funnel was treated with twice its volume petroleum ether and washed with several portions of water which removed the dye.

The original 1:1 amyl alcohol-petroleum ether solution which was filtered through the asbestos was colored by subsidiary dyes, but contained but very little total coloring matter and was not further examined.

(If the aniline-amyl alcohol solution of the dyes No. 419 and No. 593 obtained as described above, is treated with one-half its volume petroleum ether and washed with several portions of water, a qualitative separation is effected, the red dye, however, being removed first by the aqueous washing liquid.)

Application of Solubility Tables, U. S. Dept. Agr. Bull. 448, pages 22 to 33, To Certain Dyes Named in the Preceding Pages.

*Group 2*—No. 36 Chrome Yellow 2G, No. 204 Chrome Black A, and No. 299 Chrome Black F, are similar to No. 40 Metachrome Orange (No. 70 serial or cross reference number in bulletin), in respect to solubilities as follows:

With amyl alcohol and normal sodium chloride solution.

With amyl alcohol and dilute hydrochloric acid of various normalities.

With 1:1 amyl alcohol-petroleum ether mixture and dilute hydrochloric acid of various normalities.

*Group 3*—No. 202 Chrome Blue Black U, No. 289 Fast Cyanine 5R, No. 307 Fast Cyanine Black B, and No. 636 Fast Light Yellow 2G are similar in the solubilities mentioned above under Group 2 to No. 26 Croceine Orange (No. 56 cross reference number).

*Group 7*—No. 31 Amido Naphthol Red G is similar to No. 27 Orange G (cross reference No. 22).

No. 56 Fast Fuchsine 6B is similar to Azocarmine, or between No. 185 Cochineal Red and No. 27 Orange G (cross reference Nos. 15 and 22 resp.), in solubilities.

No. 216 Chrome Red B and Sunset Yellow are similar to No. 29 Chromotrope 2R (cross reference No. 25).

No. 209 Fast Blue B is similar to No. 518 Chicago Blue 6B (cross reference No. 24).

No. 282 Ponceau S is similar to No. 79 Ponceau 2R (cross reference No. 29).

(Continued on page 745)

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# The National Industrial Recovery Act*

*By* **W. H. SPENCER**
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## In General

IT is reported that on a certain occasion, Cicero, the silver-tongued orator of the Tiber, exclaimed, "O Tempora! O Mores!" which, being translated freely, means, "O what a hell of a mess we are in!" We, in our own times, with much more provocation than Cicero had, may also exclaim, "O Tempora! O Mores!"

There is, however, a measure of satisfaction in living in such astonishing times. Ancient landmarks disappear before our eyes. New economic institutions and machinery are created while we wait. A year ago, the suggestion that as a way out of our present difficulties we should resort to some form of business planning under government control would have been repudiated as smacking too much of Red Russia and the Five Year Plan. With great calmness we have now made the President of the United States an industrial as well as a political dictator and have embarked upon an ambitious experiment in the control of business.

On March 4, 1933, when the present national administration took over the reins of the government, American business, like some giant monster, lay on its back, gasping for breath. That well-known jest, uttered during the political campaign last autumn that if Franklin D. Roosevelt were elected to the Presidency of the United States, within four months to the day from his inauguration, all the banks in the United States would be closed, had become, just one hundred and twenty days before the date prophesied, a grim reality. Prices of commodities and securities had fallen to dismal depths. Politically and economically, it was a moment of unparalleled gloom.

Since March 4, a major portion of the "new deal" promised for American life and business has been revealed. The part dealing with financial institutions and transportation agencies is still in the lap of the gods and will not be revealed until early next year.

*Presented at Annual Convention, Chicago, Saturday, Sept. 9.

The President in announcing the new deal had in mind two main objectives: first, the lifting of the intolerable debt burden under which a large part of the American people were staggering; and, second, the restoration of prosperity to American agriculture and industry. For the accomplishment of the former objective, Congress enacted certain legislation, which I need not mention here, and clothed the President with extraordinarily large powers to inflate our money and currency. For the accomplishment of the second objective, Congress enacted the Agricultural Adjustment Act and the Industrial Recovery Act.

The provisions of the Industrial Recovery Act fall into two parts: those dealing with industrial recovery, and those dealing with the national public works program. It is my purpose to discuss only the first part of the Industrial Recovery Act. I come not as a representative of the Government to bring you inside information nor as a technical expert to answer questions on procedures but as a sympathetic observer to give an economic and constructive interpretation of this law.

In my discussion of the Act, I shall, first, briefly summarize its provisions; second, trace its economic genesis; third, indicate its underlying theory; fourth, discuss certain constitutional issues which it raises; and, finally, present, as I see them, its probably effects upon business recovery.

Let me, first, briefly summarize the Act.

### Summary of the Act

Speaking generally, the provisions of the Act dealing with industrial recovery provide a scheme for the stabilization of industry through a "partnership" between labor, government and industry. In the establishment of this partnership, the Act provides that the President may create an Industrial Planning and Research Agency to which he may delegate the far-reaching powers over industry which Congress has granted him.

The Act recognizes the trade association as the appropriate agency through which the joint stabilization efforts will be exerted. These groups or associations are expected as rapidly as possible to formulate and submit "codes of fair competition" for their respective industries. The President will approve these codes provided the associations from which they come are truly representative and provided they are free from provisions designed to foster monopoly. The President, as a condition of approving a code, may require that it shall contain adequate provisions for the protection of consumers, employees and others. If a given association does not voluntarily submit a code, or does not submit one which meets the President's approval, he may prescribe one for the industry.

The President, in carrying out the provisions and policies of the Act, is authorized to enter into agreements with businesses or associations, or approve agreements between them. The President acted under this authority in the publication of the blanket or master code which, when signed by a given business, becomes a contract between that business and the President.

The President, if it becomes necessary to do so, may institute a system of licensing businesses. If the President should resort to this device, no business brought under the licensing arrangement can continue without first having secured a license from the President which he may later revoke for cause. This drastic feature of the legislation was included to give the President plenary power to deal with a recalcitrant business or industry which refuses to submit to a code or in which unsavory competitive conditions persist in defiance of a code which has been approved or prescribed for it.

All codes, agreements and licensing arrangements must accord employees the privilege of collective bargaining, outlaw the so-called yellow-dog contract, and adopt such minimum wages, maximum hours, and employment conditions as the President may approve or prescribe. The legislation contemplates that these questions shall as far as possible be solved by the mutual agreement between employers and employees. If, however, employers and employees reach an impasse in dealing with these problems, the President may intervene and, after a proper hearing, prescribe standards of employment for the industry.

These codes, agreements and licensing arrangements are expressly exempted from the operation of the Sherman Anti-trust Act. In other words, the Industrial Recovery Act temporarily suspends the operation of the Sherman Act. It should, however, be pointed out that as Attorney General Cummings has recently said, it does not suspend the Sherman Act completely and open the door to all sorts of practices.

When a code has been approved or prescribed, its provisions become law. For violations of codes "in and affecting interstate or foreign commerce," the Act sets up rather severe monetary penalties. The Act also provides that, when the President shall have instituted a licensing system for any industry, if any person engages in the business without a license or violates a condition of a license which has been granted, he may upon conviction be fined or imprisoned or both in the discretion of the trial court.

This constitutes a brief summary of this extraordinary legislation. What of its economic genesis? What led us to it?

### Economic Genesis of the Act

This enactment is a confession that competition as a regulating force in industry has broken down in wide areas, and is *per se* an obstacle in the road to economic recovery. Moreover, it proceeds upon the hypothesis that

the present way of doing business, staggering under a load of sins of omission and commission, laid low by the impact of a devastating depression, has neither the vitality nor the machinery with which to extricate itself from the economic morass into which it had wandered. The title to the legislation might more appropriately have been the *National Industrial Rescue Act.*

For a considerable time following the beginning of the Industrial Revolution, that period marked by the introduction of power-driven machinery in industry, the market for goods on the whole continued to outrun production, and this was true in spite of the increased productivity of industry arising out of the introduction of machine processes. This was due to the opening up of new territory to human habitation, to the increase of population, and to the spread of popular education with its consequent multiplication of human wants.

Some time after the War between the States, a shift occurred in the relationship between the productive capacity of industry and the absorbing capacity of the market. Production gradually overtook the market and in time began to outrun it. Modern sales and advertising methods had their beginnings. Bitter, cut-throat competition appeared. Industries, already growing large because of the necessity of raising large sums of capital for expensive machine equipment, began to resort to pooling arrangements, contracts to control prices, contracts to control production, combinations, syndicates, trusts and mergers—all manifestations of a mad scramble for markets.

As technological processes, involving heavy capital investments, made larger production units possible, markets had to be correspondingly enlarged. As larger markets were developed, larger production units were stimulated, requiring still larger outlays of capital. *Thus, each inevitably and continuously fed and fattened on the other.* Service industries—banks, insurance companies, and transportation agencies—to meet the needs of the growing industrial giants, inevitably resorted to the tactics of combinations and merger.

The courts of common law, although inclined to regard competition as an unmixed blessing, were powerless to check the increasing size of the business unit. Congress in 1890, impressed by the popular outcry against predatory wealth, enacted the famous Sherman Anti-trust Act which was designed, in the words of Justice Harlan, to save the common people from economic bondage. In 1913, in furtherance of the "new freedom," Congress introduced a new type of control over business in the creation of the Federal Trade Commission which, according to Justice Brandeis, was to be "an alert and vigilant policeman to prevent further inroads by monopolies."

Although the Sherman Act may have temporarily checked the growth of the individual business unit, it was on the whole an empty gesture. The Federal Trade Commission, the new night watchman, either did not take its responsibilities seriously or was always asleep on its beat, for it did little or nothing to prevent "further inroads by monopolies." It is true that in 1910 the Supreme Court dissolved the Oil and Tobacco trusts. But in 1920 the Court approved the Steel Corporation merger. This decision was followed by a flood of mergers from 1920 down to 1929, when it ceased to be profitable to merge.

In brief, business, ceaselessly and irresistibly continued to grow bigger and bigger. Viewing the situation in retrospect, it now seems clear that the Sherman Act was not only a failure in achieving its objective of preventing the growth of monopolies, but was a positive evil in that it postponed the day of the solution of the problem of how large-scale business should be controlled.

Moreover, the increasing mechanization of industry, as the technocrats were so fond of reminding us during their brief period of popularity, had more and more tended to displace men with machines, thus swelling the army of the unemployed. This competition between men and machines also meant that workers in terms of purchasing power, in ratio to the value of the output of industry, were getting less and less in wages, thus reducing purchasing power during a period when productive capacity was increasing.

Then came the World War further complicating a situation already loaded with dynamite. To meet the voracious appetites of battling nations, the War tremendously stimulated the productive capacity of agriculture and industry here and abroad and drove commodity prices to the sky.

When the smoke of battle had cleared away, a majority of the warring nations awoke to find themselves hopelessly bankrupt. Our own nation, which had to a considerable extent fed and financed the War, found itself in possession of the promissory notes of most of the rest of the world. To the uninitiated it then appeared as if we were sitting on the top of the world. Other nations would probably have used the same words in describing the post-war situation, but with a more literal meaning. Our debtors could not pay us their debts in money, because they did not have the money with which to pay. We would not allow them to pay in goods, the only method of payment they had, because that would have interfered too seriously with our own industries. As a result, European nations, to save themselves politically and economically, more and more retired from world markets and developed local self-sufficiency. As these developments occurred, the irony and tragedy of our sitting on the top of the world became more and more apparent to us all.

These developments were particularly ruinous to agriculture which had previously depended upon foreign nations to consume large crop surpluses. In industry, when production outruns demand, the tendency is immediately to curtail production. In agriculture, however, which is

more a way of living than an industry, the opposite is likely to happen. Farmers, unorganized and unorganizable, as they witnessed the fall of prices of agricultural commodities resulting from large unconsumed surpluses, instead of curtailing production, did the wholly unintelligent but perfectly natural thing of attempting to recoup their losses by producing more wheat, cotton, corn and tobacco to be sold at the lower prices, which merely resulted in still further depressing prices. Thus, for ten or fifteen years past, the farmer, representing two-fifths of our population and ordinarily one of the largest purchasers of consumer goods, has been almost entirely out of the market.

The insidious approach of the depression in 1929 was not detected as we, as a people, were engaged in the maddest speculative orgy the world had ever witnessed. With the collapse of this speculative orgy, all of the forces tending toward depression and deflation brought us by swift and inevitable stages to March 4, 1933 and, a few weeks later, to the National Industrial Recovery Act.

### Theory Underlying Legislation

What now is the theory underlying this legislation? In other words, what is the magic or legerdemain which the President under the Act expects to employ in the restoration of prosperity? The theory is twofold: first, the restoration of purchasing power by mass reemployment; and, second, the restoration of confidence by rationalization of competition.

It will be remembered that in the trough of the depression there were in this country between 12 and 15 million unemployed persons whose purchasing power had shrunk to the vanishing point. From the beginning of the depression, or at least from the time when industrial and political leaders recognized the depression and began to take it seriously, proposals for sharing work in industry, with a view of securing greater diffusion of purchasing power, were frequently made.

During the early part of the Special Session of Congress which has just expired, Senator Black of Alabama, with the share-the-work proposal in mind, introduced a bill which would have established a thirty-hour week for all businesses engaged in interstate and foreign commerce. This law would probably have done very little good in a program of reemployment. In so far as it would have added to the cost of production, employers would have dismissed employees or have still further depressed wages.

The Black Bill was followed by the so-called Perkins Bill which would have given the government power to fix wages and hours of work. This proposal aroused so much opposition from industrial leaders that it was perforce abandoned.

Any voluntary agreement on the part of a majority of employers to employ more men, to reduce hours of work, and to raise wages would have exposed them to competitive handicaps because a substantial minority of employers would not have joined any such movement. It has been observed that Gresham's law, that bad money tends to drive out good money, applies in the field of business practices and morals: *unsound business practices and morals tend to drive out sound business morals and practices.*

Accordingly, machinery had to be set up to force all employers to cooperate in the program of mass reemployment, at shorter hours and with higher wages. The Recovery Act presents business with the opportunity in consultation with the government to establish conditions of employment and competition and with the backing of the government to impose them upon all businesses.

The Act provides that all codes, agreements and licensing arrangements shall establish maximum working hours which for the whole of industry will be substantially less than those which previously prevailed. To safeguard employees against unreasonably low wages and competitors against unfair competition, the law provides that the codes and agreements shall establish minimum wages for work. Some appreciation of what the President considers a fair working day and wage can be had by a study of the master code which he recently published for voluntary adoption.

Thus it is hoped that all industries, now placed on a basis of competitive equality, will employ larger numbers of workers to produce the same amount of goods previously produced. If the plan works out in the manner contemplated, greater diffusion of purchasing power will immediately follow. Greater diffusion of purchasing power, it is believed, will very shortly result in greater spending.

But, of course, the President is seeking to achieve something more than mere diffusion of purchasing power. The increase in spending arising from greater diffusion of purchasing power will not be very great. It is clear that the President hopes to increase the total wage bill of industry. Officially it has been announced that this is the only way —mass purchasing power by mass reemployment. This is evident from the wage scales set forth in the master code. It has been estimated that if this standard of wages were universally accepted by industry the total wage bill of American industry would be increased from 12 to 20%.

If the scheme works and if we secure both an increase in the total wage bill of American industry and a greater diffusion of purchasing power than we have had in the immediate past, there is no doubt that to a greater or less extent the increased purchasing power will find its way into the market for consumer goods which will stimulate further production, which in its turn will further increase employment, which in turn will result in still more purchasing power. And thus, in the hopes and dreams of the President, the wheels of industry will gain momentum and we as a people will be on the road to recovery.

The Act also *contains provisions* designed to restore business confidence by the rationalization of competition. Many of the codes which have been adopted and proposed contain provisions limiting plant operations with a view of curtailing production. The President apparently has the power to enter into agreements with industries, or to approve agreements between them, providing for the adjustment of production to probable demand and for the standardization of prices. The code of the oil industry contains a provision for limited price-fixing. Voluntary agreements between producers for the control of production and for the standardization of prices before the enactment of the Recovery Act would have subjected the parties to prosecution under the Sherman Act. The Recovery Act, however, removes this risk by temporarily suspending the operation of the Sherman Act as to such arrangements. The successful administration of these provisions should, on the one hand, remove the cloud of uncertainty arising out of the fear of overproduction which has hovered over industry during these days of depression, and, on the other hand, protect industry as a whole against those who seek to gain a temporary advantage by price-slashing. Stabilization with respect to prices, wages and volume of production, if it can be attained, should certainly do much to restore confidence on the part of producers, manufacturers, dealers, financiers, and consumers.

### Constitutional Issues

There are some who prophesy that the Act will never be put fully into operation. They base their prophesy upon the conviction that the program of recovery legislation will be set at naught when controversies involving its validity reach the Supreme Court of the United States. It is rumored that several members of the Court are very much concerned about the dangers of this form of social experimentation, and that from this group at least, adverse opinions may be expected.

The Industrial Recovery Act is open to constitutional attack on several counts. It is contended, for instance, that it violates the spirit of the Constitution. This, of course, is merely to say that the legislation is novel in character. But there is no precedent for declaring legislation unconstitutional on the ground that it runs counter to the spirit of the Constitution. The Supreme Court, before it is justified in nullifying a law, must find that it is in conflict with some express or implied provision of the Constitution.

Again, it is contended that it is unconstitutional because it violates the theory of separation of governmental powers by vesting vast legislative powers over industry in the hands of the chief executive. The Constitution does not expressly forbid one branch of the government to delegate its powers to another, but the Supreme Court has repeatedly said that the Constitution by implication forbids the practice.

The Supreme Court has, however, approved various types of legislation in which Congress, *even in normal times,* has delegated legislative powers to the President. The difference between the present situation and previous ones is the extent to which Congress has gone in the present instance in the delegation of legislative powers.

In view of the fact that the delegation of powers in question is of a temporary character to enable the President to meet a great economic emergency, and in view of the fact that Congress can resume these powers when it pleases, the Supreme Court can, without doing violence to the Constitution and without establishing any dangerous precedent, approve the delegation of powers involved in the recovery legislation.

It is also contended that this legislation violates the Fifth Amendment to the Constitution which, among other things, provides in substance that Congress shall not deprive a person of his life, liberty or property without due process of law. As this prohibition has been interpreted, it forbids Congress to interfere with a person's life, liberty or property, unless some social, economic or political justification can be found for the interference. Under our form of government, the Supreme Court, in terms of its social and economic views, will have to say whether the present emergency justifies the far-reaching governmental interference with business which this legislation contemplates.

What is the object sought by this legislation? The preservation of our social and economic way of living which is threatened by the most universal and devastating depression through which the world has ever passed. No one, I am sure, will deny that this is a meritorious object for the attainment of which appropriate legislation may be enacted.

What are the means which are being employed in the attainment of this object? Business planning under governmental supervision for a period of two years or for the period of the emergency. Drastic means, it may be admitted, but it must be remembered that they were not resorted to until our business and industrial leaders had had three years to rescue business from the economic morass into which it was sinking deeper and deeper. In view of the emergency, the means which are being employed in the attainment of the object sought do not seem unreasonable, although other means might have been resorted to. In short, I cannot believe that the Supreme Court will nullify this honest attempt, reasonably designed, to save us from economic disintegration.

Finally, it is contended that the law is unconstitutional in that it contemplates federal control over intrastate business as well as over interstate business, whereas the Constitution gives Congress regulatory power only over interstate business.

Now it is obvious that the President cannot attain his

objectives, that widespread confusion will result, and that great injustice will be done to interstate businesses, unless he can bring local as well as national businesses into the great partnership. Certainly, in sending out the master code, the President has made no distinction between local and national business. But how can he do this when the Constitution does not give the national government control over intrastate businesses?

It is interesting to note that the Industrial Recovery Act, in setting up penalties, refers to violations arising "in or affecting interstate or foreign commerce." Undoubtedly the legislation was drawn in this manner with the hope that the Supreme Court can and will say that Congress cannot carry out its objectives with interstate commerce without the cooperation of local commerce, and that to this extent local businesses become a part of interstate commerce. General Johnson has said that the Blue Eagle, with a cog wheel in one claw and a sheath of thunderbolts in the other "does not know anything about the difference between interstate and intrastate activities." In my opinion, this position is entirely sound. Local businesses engaged in price-slashing, riotous overproduction, and the payment of sweat-shop wages, could defeat the whole program of economic recovery.

It may be that the Supreme Court will avoid embarrassing the President by not passing upon the legislation until the emergency has passed. There is precedent for this. It may be that the President, through his campaign of publicity and appeal to patriotism, can secure such widespread, voluntary cooperation that an unfavorable decision by the Supreme Court will not seriously affect the program of economic recovery.

It has been suggested that the President may, as a method of protecting the experiment against an unfavorable decision, persuade Congress to exercise its power to increase the size of the Court, and then appoint judges to the vacancies whose views are known in advance to be favorable to the legislation. If the President should decide to do this, he would not be without precedent. In the sixties when the constitutionality of the Legal Tender Act was bitterly contested, Congress increased the membership of the Court from seven to nine, ultimately insuring a favorable decision on the law.

I cannot, however, believe that the President will resort to such dubious and vulnerable strategy; at least I sincerely hope that he will not: I should prefer that he take the attitude illustrated by Bairnsfather's famous war-time cartoon. One of two occupants of a hole on a battle-scarred field remarked: "This is a 'ell of a 'ole." His companion replied: "If you know a better 'ole, you go to it."

### Its Probable Effects on Economic Recovery

Will the legislation in question fulfill the hopes and expectations of its sponsors in the restoration of prosperity? This, I suspect, is the all-important question in the minds of most of us.

Many business economists and analysts are convinced that as early as the middle of last summer the trough of the depression had been reached, and that beginning then the balance of economic forces have been favorable to economic recovery. In support of this conviction, they offer this evidence.

(a) In eleven countries representing the principal securities markets of the world, lows in the prices of securities had been reached from six to eighteen months ago, and prices have been tending upward since that time. In past depressions the rise in prices of securities has usually been one of the first signs of recovery.

(b) In the same countries, the volume of industrial production has been steadily rising for a period of from nine to twelve months. In past depressions increase in the volume of industrial production has followed the rise in the prices of securities.

(c) Statistics issued by the International Bureau of Labor Statistics at Geneva indicate that employment has been rising for some months past in thirty-nine countries.

(d) It is not possible to state with assurance what is happening to commodity prices because in many countries, governments have been tampering with their currencies. In one or two gold standard countries, commodity prices are still tending downward slightly. On the whole, however, commodity prices have been tending upward for some months past; and this, of course, is particularly true in countries with unstable currencies.

In the United States, the balance of economic forces prior to March 1 were favorable to economic recovery. The events of the early part of this year which brought on the National Bank Moratorium, and which culminated in the near-collapse of American business, arose, not out of fundamental economic conditions, but out of the banking situation in this country. In other words, the assumption of these analysts is that business, but for our banking difficulties, would have proceeded by wholesome stages to a more normal condition, and that the national recovery legislation would have been both unnecessary and undesirable.

But, whether wisely or unwisely, Congress proceeded to enact a comprehensive program of economic recovery, and this program is being put into operation. On the question as to its probable effects on business recovery, there is the widest variance of opinion.

One economist at least has expressed the opinion that in spite of all the President can do either by inflation or through his control of industry under the recovery legislation, the deflationary forces will reassert themselves and carry us downward to hitherto unplumbed depths. Of all the bug-a-boos which lurk in the offing, this one, in my opinion is the least likely to materialize.

Other economists believe that we are on the way to uncontrolled inflation, and that sooner or later we shall travel the road which Germany has travelled. They contend that the anticipated beneficial results of the recovery legislation will be so slow in materializing that the government sooner or later will have to resort to inflation to keep things moving.

In this connection, one is reminded of the classic utterance of Abe Martin that a "little bunk now and then won't hurt you, if you don't inhale it." A little inflation may help, provided the process can be kept within control. But when the magician has produced a few white rabbits from the hat, the public pressure for more and more magic will become very great. Those who pray for inflation may find themselves in the embarrassing predicament of the good old lady who prayed for rain to save her dying cabbages. The rain came and continued, all but washing the cabbages away. The good old lady prayed again saying: "O Lord, it is true that I prayed for rain, but this is simply ridiculous!"

There are those who believe that the upward trends in business will continue, but that the intervention of the government in business under the recovery legislation is merely another hurdle which business will ultimately have to take on its road to recovery.

These diverse opinions merely prove the truth of the statement which some wag recently made that if all the economists in the country were laid end to end, they would never reach a conclusion.

There are, of course, flies in the ointment, and some of them may turn out to be horse flies. There are uncertainties in the situation which require constant vigilance. Things are happening daily which make us wonder where and when we are coming out.

One fly in the ointment, about which the Administration is now worried, is the fact that industrial production has, as compared with the increase in reemployment and purchasing power, proceeded very rapidly—perhaps too rapidly. Statistics indicate that production in July, before any substantial reemployment had taken place, had risen to 72% normal as compared with the situation in 1926. A large part of this increase undoubtedly arose from the efforts of many manufacturers to lay up stocks in advance of the increased costs of production which would inevitably flow from mass reemployment at shorter hours and with higher wages. Unless effective steps are taken to minimize this tendency, business may in the near future experience a serious setback.

That the Administration is aware of this danger is evidenced by its determined efforts during the past summer months to secure widespread adoption of the master code. This was a move to rush, as rapidly as possible, the creation and diffusion of mass purchasing power to keep pace with increased production.

Another fly in the ointment is the danger that prices will rise too rapidly and too high. It is desirable that the prices of raw materials should rise immediately and that all commodity prices should rise ultimately, and this is an objective of the recovery program. But a too rapid rise in the prices of consumer goods may defeat the program of increasing purchasing power. Of what advantage will it be to business to secure increased wage payments, if meanwhile the cost of living is moving up in substantially the same ratio? Prosperity does not lie in this direction.

The President can, of course, resort to inflation, if necessary, to increase prices of raw materials. But how can he do this and at the same time prevent prices of consumer goods from going up in the same ratio? The success of the Administration in juggling these two balls will presumably depend upon its success in cajoling, persuading or coercing manufacturers to absorb the increased wage and materials costs from the profits accruing from *the increased volume of production* until some momentum in the movement of consumer goods has been attained. Fear of inflation is counted to uncover much latent purchasing power. Retail merchants are certainly doing their part in advising patrons to buy now before prices go up.

Again there is the danger that the strict application of the blanket code, with its shorter hours and higher wages, will submerge many marginal businesses, to this extent complicating the problem of unemployment. It seems clear that the Administration hopes to eliminate entirely many so-called chiselers, fly-by-night operators and sweatshop employers who seek to make short-run profits out of present chaotic conditions. The Administration has, of course, the power to make adjustments in individual cases to save marginal businesses in so far as it desires to save them. All in all, however, the Administration believes that the strict application of the master code will produce larger gains than losses, even though many businesses will not be able to survive under the prescribed standards of purchasing power.

Finally, on the assumption that the program of recovery succeeds in developing a substantial increase in purchasing power, what then? On the one hand there is the danger that the public, particularly that portion of the public being reemployed under the impetus of the recovery legislation, may entertain the delusion that money is easy and that there is plenty more where this came from, and foment another orgy of speculation. Of course, if this should happen, our second state will be worse than our first. The government and the organized exchanges, however, have already taken cognizance of this danger and have placed some limits upon the limits to which speculation can go. By campaigns of education, the public can, it is hoped, be convinced that this way lies madness.

On the other hand, it may turn out that the beneficiaries

of the new purchasing power, remembering the bitter experiences of the past four years, will begin to hoard. From the point of view of the success of the program of economic recovery, an epidemic of hoarding would be only slightly less bad than a new orgy of speculation. The present plan of economic recovery will succeed only if the recipients of the new purchasing power immediately convert it into consumer goods. The recent campaign of General Johnson "to buy under the Blue Eagle" is designed, to combat the tendency, on the one hand, to speculate, and the tendency, on the other, to hoard, and to encourage and stimulate the conversion of the new purchasing power into consumer goods.

### This way lies success

It is my belief that the favorable balance of economic forces will continue to operate. Whether the intervention of the President, either through his power to inflate the currency or through his control over industry under the recovery legislation, will aid or impede recovery, will depend upon two conditions. The first condition is the degree of intelligence and finesse which the President and his advisors exhibit in the exercise of his vast powers. The second condition is the extent of cooperation which the President can get from business and business leaders. It is largely because I have great faith in the President's capacity for not making serious mistakes, and because of my faith in the desire and willingness of American business men to cooperate with him in this program of economic recovery that I have confidence in further and continuous improvement in business.

But do not misunderstand me. Even if it be admitted that the economically sick patient is on the road to recovery, the fact remains that it is still very sick and that it will require a long period of convalescence in which it will have to spend many hours of each day basking in the warm sunshine of public confidence and feeding on a bland diet. The patient must not get up too soon and, as I have already intimated, it must for some time to come beware of drink with high speculative content.

Julius Caesar, that doughty old warrior of ancient Rome, on one occasion exclaimed: "The die is cast, the Rubicon is crossed, and we must push on." We, too, have crossed the Rubicon and must push on. We have entered upon an ambitious program of economic recovery, and there is no turning back. The President's program can succeed and will succeed, if it gets the wholehearted support of American business and the consuming public to which it is entitled.

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## FALL MEETING, SOUTHEASTERN SECTION

THE Fall Meeting of the Southeastern Section was held Saturday evening, October 28th, Ralston Hotel, Columbus, Georgia.

The business meeting and election of officers for 1933-34 was held preliminary to the program. The following nominees offered by the Nominating Committee were elected:

Charles B. Ordway, Chairman
Alabama Polytechnic Institute, Auburn, Ala.
H. H. Fields, Vice-Chairman
Eagle & Phenix Mills, Columbus, Georgia.
C. A. Jones, Secretary
Textile School, Ga. Tech, Atlanta, Georgia.
M. T. Johnson, Treasurer
Callaway Mills, LaGrange, Georgia.

E. A. Feimster, Chairman, called the meeting to order and introduced the following speakers:

Charles B. Ordway, who gave an informal talk on "Personal Glimpses of the Chicago Meeting." In this the various articles of interest to members of the Association, presented at the meeting in Chicago, were summarized and stressed.

Harold Schroeder, Dixie Mercerizing Co., Chattanooga, gave a paper on "The Dyer as a Chemical Pioneer." This paper gave all members and guests something of real interest to think about. Everyone felt that Mr. Schroeder brought out a very important phase of future work.

R. D. Sloan, Du Pont Company, presented "Application of Sulfonated Fatty Alcohols to Dyehouse Problems," in which some very valuable pointers concerning these products were given.

Discussion of articles presented was led by Robert Harris, Spalding Knitting Mills.

Fred Crayton, Entertainment Chairman, gave the crowd a real dancing act that was highly enjoyed.

A rising vote of thanks was given the speakers for their excellent talks.

The Winter Meeting will be held in Atlanta, Georgia, an announcement of which will follow in January.

Respectfully submitted,

CHARLES B. ORDWAY,
*Secretary*

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## THE DYER AS A CHEMICAL PIONEER*

**By Harold Schroeder**
*Dixie Mercerizing Co., Chattanooga, Tenn.*

THIS is a time when all things are in a state of change. While the past history of the world has, so we are given to understand, been one of relatively steady progress, in this year, this country of ours is undergoing a succession of changes such as ordinarily, if they had occurred at all, would have occupied a century of patient endeavor.

When it is over and we have recovered our breath we shall find that a great many things to which we had be-

*Presented at Fall Meeting, Southeastern Section, October 28.

come accustomed have undergone some alteration and will never be the same again. It is my hope that the members of this Association will not find themselves unchanged amidst a changed civilization.

It is not my purpose to touch on any changes in working conditions. Such things belong to the textile industry as a whole and are not within the scope of this Association. Nor am I referring to economic conditions. Discussions of such topics have no place in what is primarily a technical society. I am referring, however, to the dyer's conception of and the textile chemist's viewpoint of the mechanism underlying the processes and methods which we all use in our work.

It is a matter of common knowledge and there is no need to enter on any historical demonstration that the greater part of the considerable progress in dyeing and finishing over hundreds of years past has come about through application of the method of trial and error. What was successful was adopted, what was not successful was discarded and forgotten without being subjected to theoretical scrutiny.

Dyeing has never had, like electricity has, the advantage of mathematically developed principles and laws to guide it. It is true that electricity did have an Edison who, without being impeded by any scholastic inhibitions, proceeded by trial and error to produce machinery and methods which successfully initiated the electrical industry but, immediately after his machines were set running mathematicians and engineers together with physicists reduced his machinery and methods to sound scientific guiding principles which from then on assisted materially in the economical carrying on of the electrical industry.

Dyeing is different. Each one of us has developed methods which accomplish the desired result, or if they do not we make changes until we do get the shade or finish required, but after hundreds of years our methods are still too largely individual and have not been reduced to a common denominator.

To put it simply, the industry as a whole understands how to produce specific shades or finishes but it does not know why certain chemicals produce certain effects.

I am not suggesting that every dyer should be a college professor but it is nevertheless a fact that, in searching after and producing shades and finishes, a dyer makes use of profound chemical and physical forces astronomical in their force and scope.

There is no need for me to labor this point to an audience accustomed to such scientific marvels as, for example, the radio. However, the physical and chemical changes undergone by a textile fiber in the process of being wet-out or softened are no less wonderful and amazing, though of less popular appeal, than the accepted miracles of long distance transmission and reception of the human voice.

The passage of waves through the ether has been reduced to numbers of uncommonly complicated formulæ but the rearrangement of the micellæ in textile finishing and the play of forces greater than gravity producing or not producing fastness in dyestuffs are still uncharted and sometimes respond only haphazardly to our efforts to control them.

I am not suggesting that we should suspend our present methods of trial and error until such time as dyeing and finishing have been reduced to a completely scientific basis. It might not be for many years that such a happy state of affairs comes to pass but I am suggesting that those dyers and textile chemists who have attained such a degree of practical experience as, for example, entitles them to active membership in this Association interest themselves in a further study of such complicated matters as chemistry, physics and mathematics. Mathematics particularly used to be safely tucked away in the cloistered halls of learning but nowadays is becoming surprising effective in business problems entirely aside from financial matters. The effects of penetrants in wetting-out yarns under certain conditions obtaining in actual practice varies in accordance with mathematical formulæ and from these formulæ the behavior of certain penetrants can be safely predicted when the operating conditions are to be varied. I would not say that the quality of dyed or finished work would be in any way dependent on a mathematically inclined dyer but the cost of such quality products might well be.

Physical chemistry is of interest to the forward-looking dyer since every operation in the dyeing including the shade matching involves some use of colloids, some effect of mass action, ionization and so forth. We all know that at times established formulæ behave in an unusual manner and practical dyers understand very well how to correct such a condition when and after it occurs. It is not too much to say that a dyer who interests himself in the study of physical chemistry and its companion mathematics will be fitting himself very adequately for continued success in the times to come.

# UNEMPLOYMENT REGISTER

Members of this association, who are without employment, should forward to the secretary a statement as to their qualifications and experience. This information will subsequently appear on these pages with an identifying key number. Employers are also requested to file with the secretary any vacancies which may occur in their businesses.—A. Newton Graves, Secretary, care Franklin Process Company, Providence, R. I.

**Key: A—Laboratory and research; B—Dyeing or printing; C—Finishing; D—Sales; E—Instruction; F—Executive**

NOTE. Persons who have obtained employment should notify the secretary at once. Prospective employers may file vacancies either with the secretary or the AMERICAN DYESTUFF REPORTER.

**A-2**

*Education*—B.T.C., Lowell Textile Institute, 1932; also course in shorthand and typing.

*Experience*—None to date, interested in quantitative analysis, experimental dyeing, color matching, dye testing and dye identification. Ability to learn quickly and will go anywhere. 23 years old, single.

**A-B-2**

*Education*—Lowell Evening Textile School, 1917.

*Experience*—Five years' experience in hosiery dyeing, full fashioned hosiery of silk and cotton and silk, also men's hosiery containing rayon, wool, cotton and celanese. Several years experience in laboratory work. Has also had experience in jig-dyeing of cotton piece goods, slub and top dyeing.

**A-E-2**

*Education*—B.T.C., Lowell Textile Institute, 1933.

*Experience*—Assistant instructor in chemistry, Lowell Textile Institute. Member of scholastic honorary fraternity.

**A-B-C-1**

*Education*—Graduate Industrial Chemical Engineer, Pratt Institute—1911.

*Experience*—One year as plant control chemist, 4 years as laboratory chemist with gas company, 13 years as plant chemist with bleaching, dyeing and finishing plant. (Rayon and cotton piece goods). Formulated processes and put them into plant operation, 1 year as chemist and demonstrator for dyestuff company, 1 year as superintendent colorist with print works printing linen and rayon, 1 year as director of testing laboratory for national dry goods concern.

**A-B-E-1**

*Education*—B.S. in chemistry at C.C.N.Y. Working now on M.A. at Columbia.

*Experience*—7 years as dye tester and color matcher for dye manufacturer; 6 months skein silk and rayon dyer; 4 years textile chemist and dyer for cotton finishing concern; 2 months boss bleacher and 4 years as teacher of organic chemistry and dyeing. Age 38, single.

**A-E-1**

*Education*—Ph.D., Univ. of Illinois, studied chemical engineering at Columbia, licensed chemical engineer, New Jersey.

*Experience*—10 years' experience teaching in colleges, subjects included chemical and textile subjects. Has had broad experience in industrial work including experience in testing materials, research and consulting. Will go anywhere; references.

**B-1**

*Education*—Educated and trained in chemistry and calico printing in Glasgow, Scotland.

*Experience*—Has been with large print works as colorist for 13 years producing first class work on cotton, rayon, wool and silk fabrics. References.

**B-2**

*Experience*—Boss dyer with one firm for 18 years, divisional supt. at print works for 1 year, in charge of processing and dyeing of cottons and rayons at large bleachery for 6 years. Prefers bleachery in East but will go anywhere. References.

**B-3**

*Experience*—Foreman piece dyer for the past 21 years. Can dye the following; celanese, rayon, cotton slacks, wool, silk and mixed fabrics. Has knowledge of finishing and laboratory work.

**B-6**

*Education*—Graduate R. I. School of Design.

*Experience*—5 years in bleachery, 7½ years as assistant dyer, 2 years as boss dyer and 3 years as superintendent of dyeing and finishing. Married, 33 years old. References.

**B-7**

*Experience*—4 years as assistant to manager in ribbon mill; 2 years as boss dyer on veils, chiffons and silk skeins; 5 years as boss dyer on ribbons and skeins (cotton and silk); 7 years as boss dyer on spun silk (pure dye and fast) resisted colors; last 12 years as hosiery dyer on silk and cotton, silk-cotton, rayon or wool. 50 years old, married. References.

**B-8**

*Education*—Chemistry and Dyeing Department, Philadelphia Textile School.

*Experience*—Eleven years experience as chemist and boss dyer on the following: woolen, worsted and cotton yarn; woolen, worsted and union piece dyes on both ladies and men's wear; wool, cotton, shoddy and mohair raw stock. Age 33, married, will go anywhere. References.

**B-9**

*Experience*—Hosiery dyer with fifteen years' experience on high grade silk hosiery; familiar with all types of machines. Age 43, married. Will go anywhere. References furnished.

**B-10**

*Experience*—Ten years in top dyeing for fancy men's wear trade, knitting trade and sports wear; also piece dyeings on men's wear, crepes, sports flannels and tropical suitings; also several years association with commission dyeing trade doing tops, worsted skeins, cotton skeins, piece dyes, peroxide bleaching, naphthols, mohair plushes and imitation caracul cloths. Familiar with many types of machines. 38 years old, single with dependents. References.

**F-1**

*Education*—Textile Institute, Alexander Hamilton Inst., Extension work at Brown Univ., working knowledge of German.

*Experience*—Has had executive departmental work with all types of textiles manufacturers. Acquainted with all types of textile machinery, dyestuff application, laboratory practice, cost methods, and checking methods and processes. References.

**DON'T FORGET**
***ANNUAL MEETING***
**combined with**
**Meeting of N. Y. Section**
**This Friday**
**December 8th—Chemists' Club, N. Y. C.**

## EIGHTY-FOURTH MEETING, RESEARCH COMMITTEE

THE Eighty-fourth meeting of the Research Committee was held at the Engineers' Club, Boston, Mass., Oct. 27, 1933, Chairman Olney in the chair. The following were present: R. E. Rose, C. Z. Draves, W. M. Scott, W. H. Cady, W. R. Moorhouse, Hugh Christison, L. N. Putnam, H. W. Leitch, W. C. Durfee.

Dr. Draves read a letter which he proposed to send to all dye and chemical manufacturers, asking for a list of their textile chemical specialties, to be published in the 1933 Year Book. The letter was approved by the Committee.

It was voted to publish in the 1933 Year Book a list of imported dyes used in this country, representing types not now manufactured here.

The "Test Methods for Textiles" issued by the Federal Specifications Board on May 2, 1933, which had been mailed to all members of the Committee, were discussed at some length. The Chairman was authorized to write to Mr. Appel at the Bureau of Standards, stating that it is the feeling of the Research Committee that the Federal Specifications Board should give credit to the Association for its participation in the preparation of these Test Methods, even though the wording of the Specifications does not precisely follow that of the Association's standard methods.

There was a discussion of the various methods of determining the percentage of grease in wool. It was agreed that this would make a good project for a Research Associate.

The Chairman read a letter from Dr. E. H. Harvey, proposing the appointment of a Sub-Committee on "Textile Terminology, Standards, and Definitions," which was discussed at considerable length.

Adjourned.

Respectfully submitted,

A. NEWTON GRAVES,
*Secretary*

## CALENDAR OF COMING EVENTS

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**Meeting, N. Y. Section, combined with Annual Meeting of the Association, Chemists' Club, New York City, December 8.**

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AMERICAN
DYESTUFF
REPORTER

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## INFLATION—

THERE seems to be no unanimity of opinion among persons whose experience should qualify them as experts in matters financial and economic as to what degree of inflation, if any, the United States is headed for, or, admitting that we have started on an inflationary career, as to just what point in that career we have reached or whither the course will lead.

As to the evils of unrestrained inflation, however opinion is virtually unanimous. The experience of every nation which has passed through any considerable inflationary period shows that no class or individual can possibly benefit except by extreme good fortune.

Dr. W. S. Landis, vice-president of American Cyanamid Co., recently returned to America after spending several weeks in studying the effects of inflation in European countries, especially Germany and France, and we have been permitted to examine his findings. In these two instances he examined two different types of inflation: the German, where the value of the original currency was practically extinguished; and the French, where stabilization was achieved on a basis of approximately 20% of previous values. In both of these cases he made systematic examination of the records and amassed a quantity of statistics, all of which showed that in neither Germany nor France did the owner of wealth in any form, whether real estate, bonds, common stocks or other equities, possess as much wealth on a gold value basis at the end of the inflationary period as he did at its start. Nor did labor fare any better. The actual purchasing power of the wages paid, no matter how rapidly these wages were advanced in terms of currency, invariably lagged far behind the prices of the goods which the wages could purchase.

The only persons or corporations to be found who could be said to have benefitted by the inflationary prices were those whose debts exceeded their assets at the start of inflation. In other words, those who were already bankrupt before the inflation began. These latter arrived at the end without either debts or assets, which might be considered an improvement over the insolvency existing before inflation began.

Selecting twenty of the outstanding German common stocks—the leading corporations in a variety of industries—the record shows that one who had his capital invested equally in these common stocks on July 1st, 1914, and who retained his holdings in these concerns or their successors, taking advantage of all stock subscription rights offered, arrived in October, 1926, when the mark was again stabilized on a gold basis, with 67% of the capital he had in 1914. If his capital had been invested in bonds, real estate or the general run of common stocks his condition would have been very much worse.

The misfortune attending German labor throughout the inflationary period is evidenced by the following figures: At the start of 1921, 3% of the German workers were totally unemployed and 5% partially unemployed. By the end of 1923, the total unemployed had risen to 28% and the partially unemployed to 42%. During the same period the German Industrial Income Index (wages calibrated to cost of living) had sunk from 90 at the end of 1920 to 43 at the end of 1923.

During this same period life insurance companies, savings banks and other fiduciary institutions practically ceased to function. When stabilization was effected in October, 1926, policy-holders in life insurance companies received new policies worth not over 2% or 3% of the original policies and depositors in savings banks fared likewise.

In the case of France, where stabilization was effected on a basis of approximately 20% of the previous value of the franc, the calamity was not quite so serious but there was no benefit to any class. As in the case of Germany, wealth invested in selected common stocks fared best of all. In the case of a selected group of the best French common stocks each 100 francs investment as of 1913 had a value of 523 francs in 1929 at which time the franc was stabilized at one-fifth its former value, so that the actual increase was practically nil.

No one believes at this time that the United States is embarked upon a course which will lead to the utter invalidation of the present currency as was the case in Germany. However, it is perfectly obvious that once an inflationary course is begun it is extremely difficult to stop. Take the course of Governmental expenditures for example. It is proposed to spend a billion dollars in

public works as unemployment relief. Before this expenditure can be accomplished, however, the purchasing power of the dollar has declined, making it necessary to spend more money for the project than originally contemplated. This means more money must be borrowed; but as Government bonds are already selling under par it means that more bonds must be issued to secure the same amount of dollars or recourse must be had to the issuance of greenbacks, either of which alternatives progressively cheapens the currency. It is a vicious cycle almost impossible to interrupt once it is started.

In a case of this kind individuals can do little but, in the aggregate, the voice of public opinion can accomplish much. It would seem to be the part of common sense for all individuals to exert their influence in every way possible toward the discouragement of a Governmental policy likely to lead to unrestrained inflation.

A. P. H.

## OBITUARY

### Charles F. Credo

Charles F. Credo, Philadelphia manager of John Campbell & Co., died suddenly on November 20th at the age of 44 years. Mr. Credo had a host of friends and was well known throughout the state of Pennsylvania, having been connected with the Campbell organization for 21 years. He is survived by his wife and two children.

### Charles M. Wilson

Charles M. Wilson, manager of the Montreal office of Ciba Company, Ltd., died the week of November 13th. His death resulted from a severe cold which subsequently developed into pneumonia. Mr. Wilson was well known in dyestuff circles in Canada and his death will mark the passing of a very good friend to many.

### William T. Elkinton

William T. Elkinton, chairman of the board of the Philadelphia Quartz Co., died on October 25th at the age of 73 years. He was connected with that company for 50 years and was in the third generation of his family to be connected with it. He will be remembered for his religious and philanthropic activities. He is survived by his wife, two children, a sister and a brother.

### Virginia Smelting Exhibit

At the Exposition of Chemical Industries, the Virginia Smelting Co. is featuring the use of sulfur dioxide in the textile industry. This will be shown partly by the use of moving pictures in color and partly by actual demonstration. The Exposition will run during the week of December 4-9.

## BOOK REVIEW

***The Chemical Formulary—H. Bennett, Editor in Chief, The Chemical Formulary Co., 950 Third Ave., Brooklyn, N. Y. Price $6.00 per copy, 537 pages.***

Here we have presented to us in a very handy reference book, the latest methods and formulae for the manufacture of hundreds of products used in modern industry. Most of the information requires no technical knowledge and can be readily grasped, even by laymen.

To obtain these formulae the editor of this interesting project has succeeded in obtaining the cooperation of a long list of experts in the various fields covered. A perusal of the book indicates that the formulae submitted are not ancient recipes but are the latest developments used in their daily work. This book will be of value when a new problem arises, by enabling one to obtain information quickly.

In this brief space it is impossible to cover the thousands of formulae given. Just a few of the subjects coverde are adhesives, alloys, antiseptics, bleaches, boiler compounds, carbon paper, castings, cleaners, colors, cosmetics, disinfectants, dyes, emulsions, etching, fireproofing, fuels, glazes, insecticides, inks, lacquers, latex, leather, liquors, lubricants, paint, paper, plastics, plating, polishes, preservatives, printing, rubber, sizings, soaps, softeners, solders, solvents, stains, synthetic resins, varnish, viscose, vulcanization, water-proofing, welding, weed killers, etc.

The Chemical Formulary is excellently indexed and will furnish a valuable tool to the technical workers of our industry.

For the executive and non-technical worker, in many cases, it lights the way to a better understanding of the many compounds and treatments with which they are in constant contact.

"Book-worms" will not like The Chemical Formulary as its cover has been treated with pyroxylin to render it washable and vermin-proof.

### Instant Rit

One of the interior displays at the Du Pont Exhibit on the Boardwalk at Atlantic City last week was devoted to the showing of Instant Rit, made by the Rit Products Corporation of Chicago, and featured Du Pont dyestuffs and fast colors. One type of Rit dyes all fabrics, while another dyes the fabric but not the lace. White Rit is used to remove all color. Several examples of Rit-dyed materials were shown in the display, including a dress which was originally black, and of which the top half was left black while the lower half showed a section with the color removed and the remaining part was dyed with jade green Rit. Other articles dyed with Rit colors included children's dresses, lingerie, lace curtains, silk stockings and handkerchiefs.

# Washington News Letter

*By* **WALDON FAWCETT**

EXPERIENCED observers at Washington are not accepting too literally the statements of leaders in the House of Representatives who have predicted that the session of Congress which will start in January 1934 may be adjourned shortly after April 1. The reasoning in support of the theory of a short sitting is that this Congress, at its first or extra session, disposed of so many of the major issues of public policy that the regular session should find on its desk only the annual Appropriation Bills and the perennial expressions of special legislation.

What places the heaviest discount upon the prophecies of a speedy release from Congress, is the inevitability of a flood of oratory inspired by the controversial questions now before the country and the national legislature. It is true that 1934 is a Congressional election year, with the entire membership of the House and one-third of the U. S. Senate facing the responsibilities of renomination and reelection. Other things being equal, the Members would prefer a relatively early adjournment in order to devote attention to their political fences. Nevertheless, conservative opinion holds that the April estimate is too optimistic.

The strategic position accorded by circumstance to "special legislation" in the 1934 session (the first session under the changed schedule of the amended Constitution) is all to the advantage of the dyestuffs industries and textile chemistry. Because, almost all pending projects of moment to the group,—say the program of textile design protection—come within the category of special legislation. Meanwhile, it should be mentioned that the subcommittees of the Congressional Appropriations Committees will be busy from early in December formulating the expense accounts or allowances of the Government Departments for the year 1934-35. Interested parties in industry must needs be prepared to make their representations thus early if they desire concessions in the Federal budget,—as for example the restoration of activities curtailed for the sake of economy at the Chemical Division of the U. S. Bureau of Foreign and Domestic Commerce.

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Interrogations received at Washington from trade sources inquire whether the contemplated drastic revision and extension of the U. S. Food and Drugs Act will in any way affect the operation of the present system for the Certification of Food Colors. The answer is in the negative. Whereas the Tugwell draft is designed to amplify and render more rigid in many respects the prohibitions upon "misbranding," there is no disposition to alter present arrangements for sanctioning the use of approved artificial colors. It may be of interest to some readers that the expanded Bill for the first time brings within the jurisdiction of the Regulatory arm of the Department of Agriculture, cosmetics as well as foods and medicinal preparations. A chief incentive for the proposed inclusion of toilet goods, etc. was found in the results of an investigation lately conducted by the U. S. Food and Drug Administration into the causes of deaths recently resulting allegedly from the presence of dyes in certain preparations advertised as capable of enhancing the brilliancy of the eyes. Up to this time, this entire class of cosmetics, not forgetting the popular hair-dyes, have been beyond the pale of the U. S. Food and Drug Administration if no curative claims are made. The most radical innovation in the plotted revision of the "Pure Food" law is to be found in the modification which would apply virtual powers of censorship to the advertising of food, drug, and cosmetic products. Up to this time the Federal control has been limited to statements appearing on the labels, containers or packages or presented in printed matter packed with or accompanying the goods in distribution. The advertising inclusion is mainly responsible for the very considerable opposition which the new Bill is destined to face in Congress.

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Identification and labeling of textile products, notably process-marking by dyers, promises to gain by the recent action of the American Bar Association in furtherance of the movement for uniform State Trade Mark laws. Ambitious to safeguard good will, textile interests have latterly had increasing recourse to State-by-State registration of brands, trade names, etc. Regardless of whether this be the sole certification available under the limitations of intra-state commerce, or be supplementary to Federal registration for inter-state commerce. Embarrassment to textile interests has been occasioned by the inadequacy of most of the State laws.

An outstanding example of the impediments to textile authentication has been afforded in New York, one of the first States to take steps to modernize the statutes under the new program. In New York State up to the present time, provision for enrollments with the Secretary of

State have been restricted to marks appearing on receptacles or packages. A trade mark actually incorporated in an article of commerce,—say a selvedge mark—has been ineligible unless also appearing on a wrapper or container. This defiance of the modern trend to direct-marking designed to carry through to the ultimate consumer has worked hardships upon marketers of fabrics. It will be corrected under standardization of State laws.

To end the confusion as between the laws of the several States, and to liberalize outdated State laws, the American Bar Association has formally endorsed a model statute evolved by a special committee of the national body. This pattern draft also serves the cause of textile identification (primary and intermediate) by enlarging the definition of a registrable trade mark. No longer is State registration restricted to technical trade marks. By the new code, entry is sanctioned for any trade or identifying mark, name, term, design, device, label or slogan. Color may be claimed as one of the distinctive elements. The model statute has an important annex in a penal provision which denounces as a felony the "counterfeiting" of any trade mark whether registered or not. Color-marks under the standardized code must be described as to color in the application for registration and the copies, counterparts, or facsimiles required to be deposited with the Secretary of State must be in color, if color is claimed.

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Contraction, under the necessities of Government economy, of the activities of the National Bureau of Standards, has brought no more revolutionary change than that which will result from the transfer of the program of commercial standardization to the jurisdiction of the American Standards Association. In a statement for the REPORTER, Dr. Lyman J. Briggs, Director of the Bureau corrects the impression in trade circles that commercial standardization work at the Department of Commerce has been terminated. He remarks that this work has, indeed, been "drastically curtailed" but has not been wholly discontinued.

The organization units transferred from the Bureau of Standards to the American Standards Association, with headquarters at 29 West 39th Street, New York, comprise the Division of Trade Standards, Division of Specifications, Division of Simplified Practice, and the Safety Code Section. Neither textile nor chemical organizations have heretofore been prominent in the federation of national technical societies and trade associations known as the American Standards Association, albeit the dyestuffs industry and allied communities have not been without representatives on the 400 standardization committees for which the American Association has drafted the services of nearly three thousand technical experts representing more than five hundred trade associations and scientific groups.

Under the New Deal, persuasion is to be expected for closer and more extensive cooperation on the part of the dyestuffs forces and textile chemists. If for no other reason than that the American Standards Association, if it is to carry on effectively the additional work which has been turned over to it, will require a substantial increase in its financial support. The Association's activities are financed through the fees of its Member-Bodies (such as American Society for Testing Materials) and the dues paid by some two hundred Company Members.

Delegation of the shifted work to the American Standards Association is, by Government officials, accounted the more fitting by reason of the fact that the Association has, over a period of some eight or nine years, manifested the most active interest in the "certification plan" whereby the device of quality-guaranty labeling has been summoned as an adjunct to the standardization of master specifications. Under the auspices of the National Bureau of Standards the certification plan has been applied to 404 Federal specifications and 38 commercial standards formulated by interested industries. There have been formulated under the auspices of the Bureau some 442 lists of willing-to-certify sources of supply representing the participation of 8,762 separate firms which have been given an aggregate of listings amounting to a total of 18,610. The specifications which, by this system, are accounted as "nationally recognized" may be either of Federal origin or the sponsorings of trade associations. Inasmuch as the U. S. Departments of Commerce and Agriculture are among the Federal units represented on the Governing Council of the American Standards Association, the Governmental influence will by no means be absent from the future direction of the specification-simplification-standardization work which has been delegated to a new clearing house.

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By executive order, President Roosevelt has established the procedure for administering the sections of the National Industrial Recovery Act which relate to competitive imports. Section 3 is that portion of the Act designed specifically to control imports which are rendering ineffective or seriously endangering the maintenance of codes or agreements under the NRA. The National Recovery Administration is, by the latest order, empowered to receive complaints from interested parties, make preliminary investigations and submit recommendations to the President. On the basis of recommendations thus arrived at, the President may dismiss the complaint or direct the U. S. Tariff Commission to make an investigation. Finally, on the basis of the facts disclosed by a Tariff Commission Investigation—and Hearings, in the event that Hearings are conducted—the President will take such action as may be deemed necessary to safeguard the codified industries. Complaints, under this plan, are supposed to be made either by a trade or industrial organization or by a group (organized or unorganized) representing more than half of the production of the line

(Continued on page 744)

# The Dyer and the Final Handle

*By* G. L. ATKINSON

THAT the dyer can impair or enhance the handle and finish of a piece during dyeing, is not a fact that is generally realized. The handle and finish of any cloth is not regarded by the majority of dyers, as within their domain at all.

Handle and finish they repeat, are the jobs of the finisher, and there the matter rests in the majority of cases. In the old days, this attitude was understandable, and the problem was not pressed any further, but in these days of shaky and changing markets and fastidious customers, the reverse is the case. When even the smallest item may be the means by which goods are either accepted or rejected, the dyer cannot afford to leave any stone unturned, or any matter unprobed, which may help in the goods dyed by his concern being just that little better than the next firms.

To many dyers, as long as they receive all dyeing particulars, i.e., those which are essential for the correct dyeing of the pieces, that is all they require. Too many dyers, in addition, take the attitude that as long as the goods are correctly dyed and production costs are kept to a minimum, that is the end of the matter as far as they are concerned. Today, the post of dyer is more complicated than ever, mainly because business is not only difficult to get, but is equally difficult to keep once it has been secured. Formerly, as long as the dyer knew the shade that the pieces had to be dyed to, whether the dye had to be fast or not, and the poundage in the vessel, that was all he required, and as long as the pieces were up to standard regarding shade and no dyeing faults were discernible in the pieces when dried, he had done his duty and the matter as far as he was concerned was finished.

Formerly the handle and finish of a fabric were decided in the preparing and finishing departments, the view being taken generally, that the dyeing operation should not contribute in any way to the finish and handle of the fabric. The type of finish which is required for any fabric is achieved for the greater part during the preparing of the cloth, but the handle of any piece is only partially enhanced during its preparing, the finishing operations generally having a greater effect upon the handle of the fabric.

It is in this matter of the handle of a cloth that the dyer is in many cases at fault although there are today many dyers who cannot see the truth of the argument.

Washing and cooling off times for the dyeing of any fabric are to the majority of dyers simply a means of assuring that all loose color is washed from the goods after the desired shade has been obtained. This is entirely a wrong attitude, for although the cooling and washing off times are important in the dyeing operation for the correct washing off of the cloth, they are equally important in quite another direction.

In the scouring operation which is mainly responsible for the handle of the fabric when finished, the cooling and washing off times are not merely important but are vital, particularly in the cases of the heavier types of cloths such as suiting for men's wear where the handle and the finish of the fabric are of paramount importance. The washing and cooling off times during the scouring operation often determine whether the final handle of the cloth shall be mellow or harsh, a factor which is of vital importance in the cases of the heavier types of cloths such as those previously mentioned.

Some cloths may require very little time in cooling down to attain a good soft handle when finished. Others may require a much longer washing off in cold water, otherwise they are very harsh in handle when finished, and the whole benefits of the scouring operation are lost. With many cloths which have been correctly cooled down and washed off during the scouring operation the benefits are lost through wrong or badly carried out washing off after the dyeing operation has been completed.

As is well known, to take a very broad case, if many wool cloths are scoured and then cooled drastically by running them through cold water, the handle of the cloth is seriously impaired. In many cases when this is done the final handle is quite harsh. Just the same thing occurs when goods are boiled during the dyeing operation and then are cooled off too readily by running the goods through cold water.

It is imperative, if the best results are to be obtained, when the actual dyeing operation has been completed that all washing off of loose color from the fabric should be carried out with warm water. The cooling down which affects the final handle of the fabric to a much greater degree than is generally realized should be carried out gradually and not drastically as is often the case.

There are many cases of crossbred pieces which are steamed after the crabbing operation merely in order to effect a certain softness in the final handle. The temperature through which these pieces pass is far in excess of that of the dyeing operation, the wool fibres of the cloths

in this instance being for some considerable time in the plastic state, something which is of rare occurrence during the dyeing operation. The best results are obtained when these pieces are allowed to cool down without being disturbed, but this in the greater number of cases cannot be done today on account of the great loss of time and the pressing needs of production. They are generally cooled off by artificial means such as passing the goods through the cooling off machine. This machine, in order that the best results may be obtained from the point of view of the final handle, is equipped with three or more troughs,—the goods passing first through warm water, then through aired water, and finally through cold water, the cooling off in this case being continuous.

It will be appreciated by this means that the cooling off of the goods is carried out as gradually as possible and not drastically, which method would impair the final handle of the cloth. The cooling down of the pieces in the dyeing vessel is just as important and care should be given by the dyer of the pieces to see that the cloths receive the treatment during this part of the dyeing operation, which is the most appropriate to any particular cloth.

In order to achieve the maximum results with regard to the final handle of the cloth, it will be obvious that the dyer will have to know more about the goods that he is dyeing than the particulars which are just essential for the desired shade being obtained. He should be conversant with what methods the goods have been subjected to during the whole of their preparing. He should know whether they have been crabbed or steamed or merely scoured. He should also know whether the goods are liable to develop faults and whether any special precautions have been taken during the preparing of the goods to achieve a softened handle when finally finished.

It is little use spending time and money and puzzling brains to devise the best scours for certain cloths to achieve a softer handle than had been possible before, if after the goods are dyed they are going to be cooled and washed off in a haphazard manner without thought being given as to whether the cloth will stand the treatment or whether the treatment is suitable for the cloth. It is no uncommon thing to walk into any dyehouse and find that the washing and cooling off times are the same for any class of fabric. In many cases the only difference in time and in method during this section of the dyeing operation is in the case of very heavy cloths which require quite a time in the dye vessel before the shade is obtained. In this case the only difference generally is that the washing off time is lengthened.

To go a little further into this question of washing and cooling off after dyeing, many faults are caused in pieces, all of which could be avoided by the use of a little care and discretion. With such goods as poplin and repp pieces, if these are cooled down drastically (and this is often the case), it will be found that the pieces are badly cockled. This is entirely due to the fact that the pieces have been cooled down much too quickly. As the goods run either in rope form or in open width in the dyeing vessel, and the goods are brought down from a high temperature too quickly, shrinking takes place. This would not be bad if the goods were held under tension in both width and length, but in the dyeing vessel, whether at open width or in rope form, the goods are not under tension in any way, with the result that localized shrinking takes place, the shrinking is not even, and the tension in the fabric is not equal, with the result that in poplin and repp cloths with their simple crossover weave cockling always takes place.

With the heavier types of cloths such as medium weight botany serges, if cooling off is carried out too drastically the cloth develops crimps and sometimes crow footing which are difficult to remove.

It will be appreciated that the job of the dyer does not consist of merely dyeing the pieces, that is, in gaining the correct shade upon the fabric. His work is not ended when this has been done, a factor which has not occurred to many dyers today. Obviously a concern, which is getting much closer co-operation from its dyer with regard to the handle of the fabric and the individual treatment of certain types of fabrics, is going to be far in advance of a concern whose dyer contends that as long as the goods have been dyed to shade his job has been discharged.

Not only are the washing and cooling off times important from the point of view of the final handle of the cloth, but many costs can be saved and faults avoided by the use of a little care and discretion. The day has passed when the dyer merely dyed the pieces and paid no attention whatsoever to the cooling and washing off of the goods. His handling of the pieces during this part of the dyeing operation is just as important as the preparing processes and the skill of the finisher. Piece goods can be impaired by an indifferent dyer and they can be enhanced by a dyer who takes a step further than just the actual act of dyeing the goods.

If the best results are to be obtained and work is to be got and kept, the dyer today must study the goods he has to dye, their peculiarities, faults, and the type of finish and handle desired.

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alleged to be imperiled by offending import conditions. Complainants must be prepared to furnish (in conformity with a prearranged Schedule of Information) definite and detailed evidence that challenged imports are actually and seriously endangering the maintenance of a code or agreement. Specific information as to production will be presumably demanded in all cases, because an indictment against any class of importations may be sustained only if it appears that the unwelcome goods are entering the United States in a volume that represents a steady increase of ratio or percentage in proportion to the domestic production of competitive commodities.

## ANALYSIS OF DYE MIXTURES

(Continued from page 726)

No. 180 Fast Red VR and No. 240 Acid Black 10B are similar to No. 179 Azorubine (cross reference No. 37).

No. 814 Direct Fast Yellow is similar to No. 463 Azo Blue (cross reference No. 46).

*Group* 8—No. 57 Amidonaphthol Red 6B is similar to No. 185 Cochineal Red or New Coccine (cross reference No. 15).

## FURTHER SOLUBILITY DATA

**Behavior of basic dyes when their hydrochloric acid solutions are shaken with amyl alcohol. Statements refer in all cases to amount of dye taken up by an equal volume of the organic solvent.**

| | | *4-Normal Acid* | *¼-Normal Acid* | *1/64-Normal Acid* |
|---|---|---|---|---|
| 729 | Victoria Blue B | Nearly all extr. | Practically all extr. | Practically all extr. |
| 749 | Rhodamine B | Nearly all extr. | Practically all extr. | Practically all extr. |
| 20 | Chrysoidine | Nearly all extr. | Nearly all extr. | Nearly all extr. |
| 841 | Safranine | Larger part extr. | Nearly all extr. | Nearly all extr. |
| 909 | Cotton Blue | Chief part extr. | Larger part extr. | More than ½ extr. |
| 655 | Auramine O | Chief part not extr. | Larger part extr. | Nearly all extr. |
| 657 | Malachite Green | Chief part not extr. | Nearly all extr. | Nearly all extr. |
| 680 | Methyl Violet | Little extr. | Chief part extr. | Practically all extr. |
| 677 | Magenta | Little extr. | ½ more or less extr. | Chief part extr. |
| 922 | Methylene Blue | Chief part not extr. | ½ or more extr. | ½ or more extr. |
| 793 | Phosphine | More than ½ extr. | Less than ½ extr. | More than ½ extr. |
| 331 | Bismarck Brown | Larger part not extr. | Chief part not extr. | Chief part not extr. |

**Dyes of Groups 1 and 6. Amounts extracted from dilute hydrochloric acid solutions when shaken with an equal volume of 1:1 amyl alcohol petroleum ether mixture.**

| | | *4-Normal Acid* | *1/64-Normal Acid* |
|---|---|---|---|
| 749 | Rhodamine B | Larger part extr. | Chief part extr. |
| 20 | Chrysoidine | Chief part extr. | Chief part not extr. |
| 729 | Victoria Blue B | Little extr. | Nearly all extr. |
| 841 | Safranine | Chief part not extr. | Chief part not extr. |
| 909 | Cotton Blue | Chief part not extr. | Little extr. |
| 680 | Methyl Violet | Little extr. | More than ½ extr. |
| 657 | Malachite Green | Little extr. | Larger part not extr. |
| 677 | Magenta | Little extr. | Larger part not extr. |
| 655 | Auramine O | Little extr. | Chief part not extr. |
| 331 | Bismarck Brown | Little extr. | Little extr. |
| 793 | Phosphine | Very little extr. | Little extr. |
| 922 | Methylene Blue | Very little extr. | Little extr. |
| 703 | Methyl Alkali Blue | All extr. and precipitated | All extr. and precipitated |
| 666 | Acid Green B | Not extr. | Little extr. |
| 698 | Acid Violet | Not extr. | Little extr. |
| 714 | Patent Blue A | Not extr. | Chief part not extr. |

**Dyes of Group 9. Amounts extracted by aniline, and by 1:1 aniline-amyl alcohol mixture.**

| | | *Aniline* | *1:1 Aniline-amyl alcohol mixture* |
|---|---|---|---|
| 671 | Acid Glaucine Blue | Chief part extr. | Nearly all extr. |
| 670 | Acid Light Green | Chief part not extr. | Chief part extr. |
| | p-Hydroxy Derivative of No. 671 | Chief part not extr. | Chief part not extr. |
| 737 | Wool Green S | Little extr. | Chief part not extr. |

Grateful acknowledgement is made to Professor Burleigh Reed of Washburn College for aid in connection with the experimental work. Also to Dr. C. F. Schaumann, E. I. du Pont de Nemours & Co., who kindly furnished several of the dyes used.

[1] U. S. Dept. Agr. Bull. No. 448. Jour, Ind, Eng. Chem, *5* U. S. Dept. Agr. Bur. Chem.(1913), 26 and *12* (1920), 883. Circ. 113.

[2] U. S. Tariff Commission Report No. 19. Census of Dyes and of other Synthetic Organic Chemicals, 1930.

**Extraction of phthalein indicators from dilute hydrochloric acid solutions by ether, and by petroleum ether of Sp. Gr. 0.65. Statements refer to the amount of dye taken up by the organic solvent when shaken with an equal volume of the acid aqueous solution.**

### Ether as Solvent

| | *4-Normal Acid* | *¼-Normal Acid* | *1/64-Normal Acid* |
|---|---|---|---|
| Phenolsulfonephthalein | Chief part not extr. | Larger part not extr. | Chief part not extr. |
| O-Cresolsulfonephthalein | Less than ½ extr. | Larger part extr. | Less than ½ extr. |
| Didromcresolsulfonephthalein | Practically all extr. | Nearly all extr. | Chief part extr. |

Phenolphthalein, thymolphthalein, a-naphtholphthalein, thymosulfonephthalein, didromthymolsulfonephthalein and tetrabromphenolsulfonephthalein are extracted almost completely by ether from hydrochloric acid solutions of acid normalities 1/64 to 4.

### Petroleum Ether as Solvent

| | *1/64-Normal Acid* | *¼-Normal Acid* | *4-Normal Acid* |
|---|---|---|---|
| Thymolphthalein | Little extr. | Less than ½ extr. | ..... |
| Dibromcresolsulfonephthalein | Chief part extr. | Little extr. | Not extr. |
| Dibromthymolsulfonephthalein | Nearly all extr. | Nearly all extr. | Chief part extr. |
| Tetrabromphenolsulfonephthalein | Larger part extr. | Very little extr. | Not extr. |

Phenolphthalein, phenolsulfonephthalein, o-cresolfonefthalein, thymolsulfonephthalein and a-naphtholphthalein are extracted in very small portion, if at all, by petroleum ether from hydrochloric acid of normalities 1/64 to 4. The two indicators last named are partially precipitated in the acid petroleum ether mixtures.

### General Releases

The General Dyestuff Corporation has released cards on the following new products:

*Soromine N Powder*—a new softening agent for rayon or mixed fabrics of rayon and cotton, which is said to impart a smooth and soft handle to the material. It may be used in the dyebath or as an after-treatment. In solution the product is said to be practically neutral, its resistance to lime is said to be excellent, and it is said to be particularly suited for white goods as it does not form yellow tints.

*Indanthrene Direct Black G Paste and Indanthrene Direct Black RR Paste*—especially recommended by the distributors for the production of deep black shades on cotton goods. They are applied by the direct method of dyeing and the dyeings are said to have excellent fastness to light, washing, boiling soap and chlorine and if the usual precautions are observed, the dyeings are said to withstand the ordinary boiling soda chlorine bleach. These new dyes are recommended by the General Dyestuff Corp. for machine dyeing due to their solubility properties.

### New Textile Catalogue

A new textile catalogue, to be circulated widely among all classes of textile mills in this country, will be published in 1934 by the Davidson Publishing Co., New York.

The new publication, to be known as "Davidson's Textile Catalogues and Buyers' Guide," will cover machinery, supplies, power equipment, chemicals, dyes, soaps, oils, belting, reeds, shuttles, bobbins, yarn and services, the company announces. It will include a buyers' guide section with 2,300 separate headings.

Advertising rates are $75 per page for the first page, and $65 per page for additional pages. The company has published textile directories since 1866.

### Acquires General Explosives Corp.

The American Cyanamid Company has acquired the General Explosives Corporation, manufacturers and distributors of Blasting Caps, Dynamite, Permissible Powders, Blasting Powders and allied products, with general offices and works at Latrobe, Pennsylvania. The General Explosives Corporation will be operated as a Division of the American Cyanamid & Chemical Corporation, 535 Fifth Avenue, New York City.

### S. O. C. M. A. Meeting

The regular monthly meeting and luncheon of the Synthetic Organic Chemical Manufacturers Association was held at the Chemists' Club, New York City, on November 14th. President Merz presided.

Those present enjoyed an excellent address by W. B. Bell, president of the Chemical Alliance, Inc., in which he spoke of the progress of the general code for the chemical industry and also the assistance which was given to various sub-divisions who contemplated preparing supplemental codes. He also spoke on the dangers of inflation.

The date for the Annual Meeting was changed to Thursday, December 7th.

### Color Matching Units

Color matching is said to be facilitated by the use of Ivanhoe Trutint Units which are said to duplicate daylight as reflected by the North Sky. In order to duplicate daylight it is necessary to reduce the red and yellow rays from an ordinary mazda lamp. This has been accomplished by the use of filters and a blue glass plate is used for this process. The housings of the units are so ventilated as to prevent excessive heating. Besides the use of these units in color matching they are also said to satisfy requirements for grading, inspection and similar processes. They are marketed by the Ivanhoe Division of the Miller Co., Meriden, Conn.

## CLASSIFIED

**The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help watend, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.**

WANTED: a connection with a finishing plant as quality man to take charge of folding and packing. Have had 15 years' experience covering all kinds of materials, their put-ups and handling. Best of references. Will go anywhere. Apply Box No. 794, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.